



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

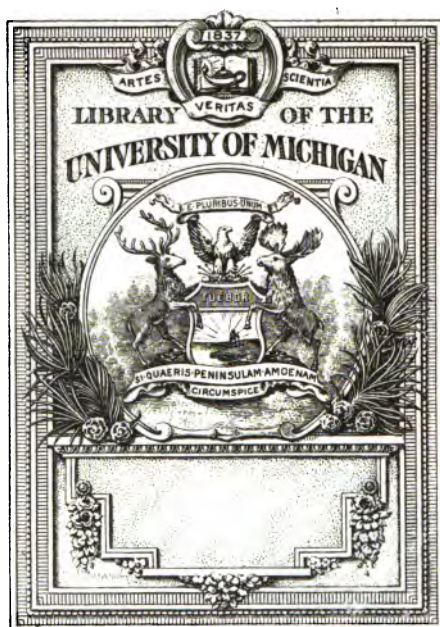
Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



QH

325

S14









*C. S. John*

A CONVERSATIONAL LECTURE  
ON  
THE ORIGIN OF LIFE,  
AND  
CELESTIAL MECHANICS,

BY  
DR. O. S. ST. JOHN,  
=

*Delivered March 11th, 1892, in the Library of his daughter,  
Mrs. W. C. Andrews, 2 E. 67th St., N. Y. City.*

---

T. A. WRIGHT,  
PUBLISHER AND PRINTER,  
NEW YORK.  
1892.





## PREFACE.

The dual quality of electricity has been a subject which has engaged my attention for many years, and it has been the purpose of the following address, which I gave at the request of friends, before a small assemblage of invited guests, at the home of my daughter, to set forth some of the latest facts and my final ideas concerning this subtle force.

My opinions have been strengthened by every discussion of the many facts connected with it, and every expression of my conviction has still further confirmed me, notwithstanding the differences of opinion entertained by electricians and their criticisms of the ideas I have endeavored to set forth.

In the year 1840 I first contended for the probability of an electrical principal as a means of explaining the phenomena of the force we term Life—whether that life is cosmical, animal or vegetable,—and I have said that electricity was the *vis vitia* of ALL the phenomena we call life. I have addressed many letters to various scientific men asking their opinions upon this subject, and have asked if they concurred in my views, but it has been very difficult to elicit a response upon a

subject which has been, and is, largely experimental, and a part of which still remains as an hypothesis. This hypothesis is strengthened by many known facts, and by many probabilities, and the near future will doubtless prove it to be a scientific truth capable of actual demonstration. The present popular objection—"difficult to prove"—will, I am sure, soon pass away.

In the following address I have endeavored to show the effects of dual electricity in celestial mechanics, and in the origin of life upon this planet in a long past geological age. I have endeavored to show that it is sufficient to account for many cosmical phenomena, and that it is the vital principal we call Life acting upon organic structures. Such a discussion of so important a subject must necessarily stimulate others to continue the work I have been engaged in, and to carry it forward to a point when it can stand as a solid scientific truth.

The following pages, with a few minor alterations, are a copy of the stenographer's notes taken when the address was given, and are intended, for those friends who were present, and for others whom they think would be interested in the subjects discussed.

New York, August 23d, 1892.

## INTRODUCTION BY W. C. ANDREWS.

### LADIES AND GENTLEMEN:

Mrs. Andrews' father, DR. ST. JOHN, who is a member of this family when we have the pleasure of his company, has somewhat original, and possibly rather unique, ideas concerning Celestial Mechanics and the Origin of Life upon the earth. These subjects have long been a matter of discussion in our family. He has kindly consented to talk to the family circle and invited guests, and hence this little gathering that I am so delighted to see before me. We will now listen to DR. ST. JOHN.



# THE ORIGIN OF LIFE.

---

LADIES AND GENTLEMEN :

I shall have the honor to say something to you this evening on THE ORIGIN OF LIFE upon the earth, and of the dual qualities of that potent and subtle force we call ELECTRICITY. By life I mean the action between particles of matter, whether cosmic, chemical, vegetable or animal.

This is not a time for declamation ; it is a time to advance quietly, if possible, thoughts which you will have no difficulty in comprehending, and if you are to get the spirit of what I wish to advance, of course the more simple the language the better. It would be absurd for me to deal in scientific terms on such an occasion as this ; and as I have only, in fact, one or two cardinal points that I wish to impress, which convey the whole, and are the foundation of the little theory that I propose to set forth, you can easily understand that if I communicate the ideas to you that I wish to, to enable you to see the whole fully, it cannot take a great while.

It is a very difficult task to undertake at once to discuss such occult ideas as that of the *vis vitæ* of everything. Life is not confined to one field ; neither to animals, vegetables, nor minerals ; nor is

it alone cosmic. It ranges through the whole field of matter. It is a very subtle question, and yet, although it has never been successfully illustrated, or hinged upon, in my humble opinion, if we take the base of my argument, and the other principles which belong to that theory, and adhere closely to them, under all circumstances and all difficulties of investigation, we will, I believe, arrive at a clear and final solution of it. It is simply this :

Life is a result. It is not a specific entity. It comes of the action of physical matter upon physical matter. There is one material force that, like Newton's gravity, pervades the whole system of natural existence, and "exists wherever matter exists;" that force we call "ELECTRICITY." At this day more is known about that branch of science than was known in the days of Milton, Herschel or Newton.

The question has arisen oftentimes, among men talking upon this subject, as to whether there is any such thing as death ; that life pervades everything ; that when we cease to live, as ordinarily understood, and lay down in what we call death, ordinarily speaking, we say life is ended ; but when you understand, or take into consideration the activity of particles of matter, everywhere, and that, the very process which has built up the body, into the shape we call life, is the very process by which everything moves forward in what we call death ; and, speaking of it scientifically, the very law which builds up a planet, a mineral, a vegetable or an animal, is the law which is at work, after we

cease to breathe, and is ordinarily called death. Science asks, where does life end, or begin? That law depends upon two properties of electricity; and I wish, if you please, that you will keep that always in mind—that electricity is the only force known to science which possesses the dual quality of drawing to, and repelling from, particles of matter. The force which draws to, which Newton calls gravitation, is electro-magnetism. I assume that; for everything is hypothesis, and the best of theories have failed, and if mine meets with the same fate I shall find no fault.

Keep in mind that the attractive and repulsive forces of electricity are exactly equal. The force with which bodies are drawn together, and the force with which they are repelled, are exactly equal; and these forces and laws of electricity, answer exactly to what the law of gravitation does as to distances and densities, and inverse squares of distances, as laid down by Newton, with reference to what he calls gravitation. Speaking of this subject, with these points in view, gravitation, as expressed by Newton, (but never explained), in my mind, means nothing, or at most, means only half, of electrical-magnetism; and there it stops. One planet may gravitate towards another; a planet may gravitate towards the sun; but Newton never tells you what drives it away, and there is no force known to science, which can perform and does perform both of these duties, but electricity.

These forces of electricity, attractive and repulsive, are like electricity itself, ubiquitous. They

... ..

are omnipresent; they are everywhere present. They are not only at work among the planets, but in the field of smaller matter. They are present everywhere, and therefore they are acting upon particles of matter everywhere.

You understand, of course, that all material existences have been represented by atoms; that everything is in little globules. Take a bag of very fine shot, and let that represent all material existences; that bag would be full of little globules. Now those particles move towards each other and are repelled, and there is no power that both repels and attracts, but electricity. Magnetism, you will say, does the same thing; but you will bear in mind, that magnetism is nothing more or less, than localized electricity, although it is not so treated in books.

If I say, that there are the two poles of an electric machine here, and, if I put a copper wire between the two poles of the electric machine, and gather the electricity, (electricity is not generated, it is gathered, collected;) and, if I send a current of electricity through that copper wire, which is not a magnet, it becomes a magnet; if I hold a plate of needles near it, they will gather on it and hang in festoons, down to the table; when I stop the current of electricity coming or going through that wire, everything that is attached to it, while the current is going through it, drops, when the current ceases, proving clearly that while the electricity is passing through the wire, it is a magnet; but the moment the current is cut off, the wire is not a magnet.

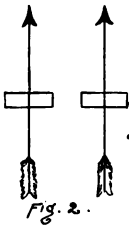




Now, suppose I hang a thread down there, and I attach to the end of it a light substance, like the pith of the elder, suspending it between the two poles, and I charge those poles with electricity. Here is the current. This ball immediately begins to vibrate, and comes to one pole of the electric machine; when it strikes this pole, it becomes of the same electricity with this pole; it is positive; so the instant it is of the same electricity with this pole, then, the law attaches that similarly electrified bodies repel; oppositely electrified bodies attract. Then, when it strikes that pole opposite, it becomes of the same magnetism; immediately it is repelled, and drawn until it goes to the opposite pole or point, and then when it becomes of that electricity, the act is reversed, and it flies backwards and forwards, like the clapper of a bell.

That much to show the dual quality of electricity. Now for magnetism (localized electricity).

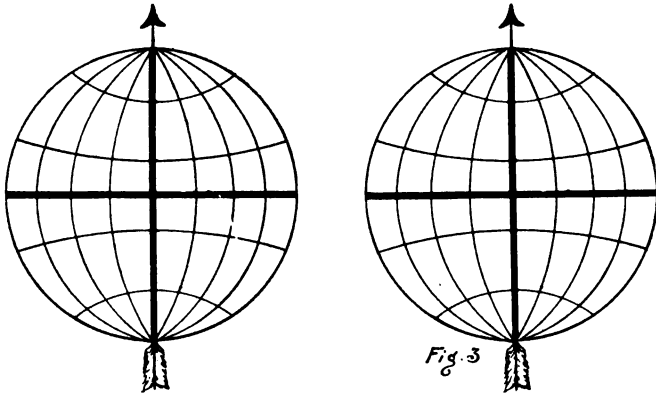
You will, all of you, recall the experiment of the piece of cork on the water in a tub, with a magnet laid on it, (Fig. 1).



If I put another one by the side of it, poles in the same direction, as in Fig. 2, those two bodies can never act together. Similar poles, the law is, repel; opposite poles attract. You will keep in mind, that in celestial mechanics, all of the celestial bodies, particularly and clearly, on the point of the solar system, the north

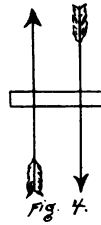
poles all point one way, north, and of necessity, the south poles the other way, south.

By that law of similar poles repelling, suppose these are two planets ; they cannot come together.



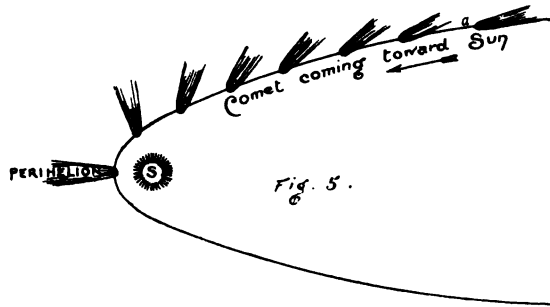
To suit our purposes, with that law, no two planets can possibly, come together. They will come within a certain range of electro-magnetic force, which may be illustrated by taking a horseshoe magnet, and dropping a needle. We take the magnet and run it on the carpet, and when the needle is within a certain range of the magnet, it jumps to the magnet, if the poles are reversed and opposite ; but, mark you, that needle will lie still, until we run the magnet within a certain range ; then it comes within the field of the magnet, showing that the power of magnetism, although localized electricity, has its limits. These celestial bodies will come within a certain range of electro-magnetism ; but when they

reach a certain point of attraction, and repulsion, they will stop, become very respectful to one another, and separate again, in obedience to the law, that similar poles repel, as well as general similarity in electric condition. Now if I reverse the magnets, they will come together. If I put these floating magnets again as I had them at first, poles the same way, (Fig. 2), they will separate from one another, turn around, and come back, (see Fig. 4), with poles the opposite way; then they will come together, and stay there.

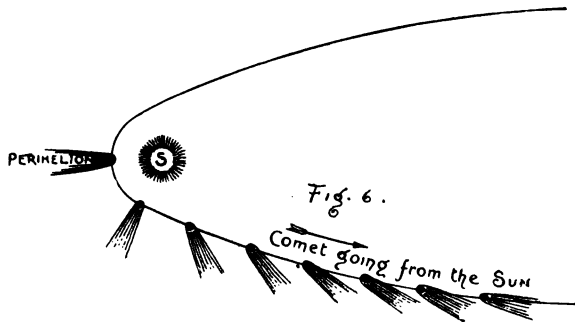


If I have established the point clearly in your minds, that magnetism is localized electricity, I proceed to the effect of it upon a comet. Comets and planets do not move in their right courses, or in exact circles. Their track is elliptical, although astronomers say that their track is *nearing a more exact circle*, all the while, and *nearing the sun*. The question then is: What will become of the planet? Will it go into the sun, or will it be repelled? Mr. Young of Princeton says it will begin to enlarge its circle again, after a certain proximity and go away from the sun. That is reasonable. It becomes similarly electrified with the sun, and then is repelled; and to continue the line of march, must return to the ellipse. Comte in his positive philosophy, however, says, if the earth came off from the sun, it must ultimately go back to it.

Suppose the figure on line *a*, Fig. 5. to be a comet coming down on that upper arc; it draws,



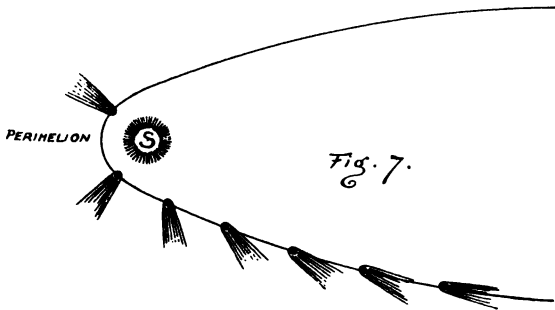
(Newton says gravitates,) towards the sun. When it has got to the end of its curve, or to the sun, it may stay there; it cannot go any further by what Newton calls gravitation. But, if you apply the laws of electricity to that comet, you will see how it comes down to, near the sun, and recedes with the scintillations of electricity, which, I think it may be claimed, enter largely into the composition



of the tail of the comet. It is coming, and the body of the comet precedes; now, it comes around,

and, you will see, keeps from the sun ; the body is nearest the sun, and the tail of the comet, which is generally treated as a shadow, opposite **from** the sun ; it comes around, keeps turning, and as it goes off, the tail of the comet is reversed and still from the sun ; now it goes down on the lower arc, repelled by the sun, having become of the same electricity. It gravitates towards the sun, but cannot gravitate from it ; it is repelled by the law of similarity in electricity with the sun.

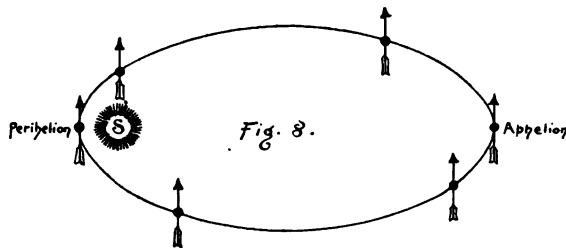
There is no other line of reasoning to my mind, that is satisfactory. I say the comet goes around the sun at perihelion (see Fig. 7).



You will see that the scintillations are straight out from the sun, when it goes around the sun, close around ; it must necessarily become of the same electricity with the sun. Now, the law is: Similarly electrified bodies repel. Becoming of the same electricity with the sun after it passes perihelion at this point, right at the sun, then it begins to

repel, and goes off indefinitely, in curve and distance, with different bodies.

That is the strongest confirmatory idea that you can have. The comet gives the strongest impression of attractive and repulsive qualities, and the change of electricity, by its circuit. The planets are all the same, only their ellipse is not so acute. It comes more like this :

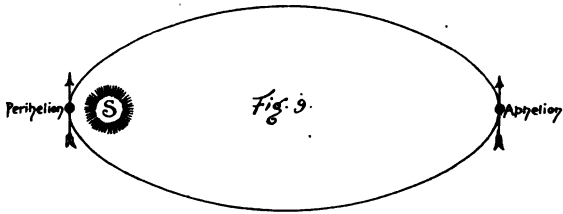


and the sun is, at one and the same stage, with the comets. Now you will see: Take the earth, for instance ; when it is at aphelion, it is of negative theme ; it has gone so far from the sun, that it has lost its positive quality and become negative. As it is negative it becomes attracted towards the sun, its rotary motion, causing centrifugal tendencies to become active, and it moves around, with a steady tendency direct from the planet to the sun, wherever its centrifugal tendencies would keep it from that track.

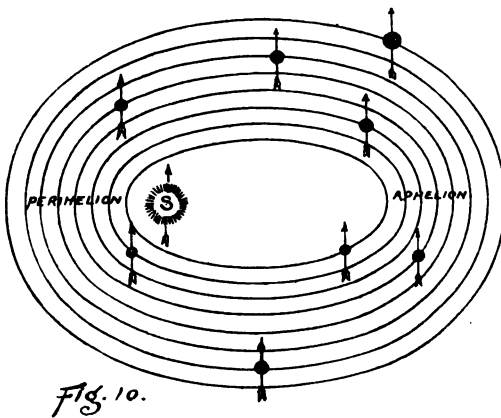
There is no independent centrifugal force.

When that planet goes around, nearest the sun, at perihelion, it becomes of the same electricity

with the sun, and as soon as it passes perihelion it is repelled, and makes the circuit, the simplest thing



to my mind, that can possibly be described. Keep in mind that invariable, infallible law of repulsion and attraction, the dual quality of electricity, and you have the whole.



Suppose we have the whole number of the planets there in different circles, their poles all one way and axis parallel ; they never can come together.

They can come within a disturbing distance, but never together. You will see that illustrated in the discovery made by La Veriere. He could see a commotion among the planets, and he concluded that that commotion among the planets must be caused by the attraction of some other body. He measured the circumstances and weighed them with mathematical certainty, saying: "There must be another planet there;" but he had not seen it. He wrote a letter to the Astronomer in Berlin, named Galle, who had the best instrument there was in use, and said: "Please turn your telescope, in a certain direction, and see if I am right." It was done, and in twenty minutes, or half an hour, he discovered the planet. He wrote to La Veriere: "If you look in such a direction, carefully and closely, you will see your planet." He did so, saw, and understood it; and the world has received it as a new planet.

You will see that that planet brought nothing together; there was no collision; they would come within a certain distance, respect each other, and move away.

Stahl's and Woleston's theory of combustion was, that there was a specific principle, that they called "Phlogiston," that caused combustion; it meant just nothing at all, and after one hundred years, observers found it so.

So of ether, according to my imagination and my reflection, means just nothing at all. It describes nothing. It is stated that there is a thin, subtle fluid pervading all of the interstices between heavenly bodies, but there is no plausible evidence



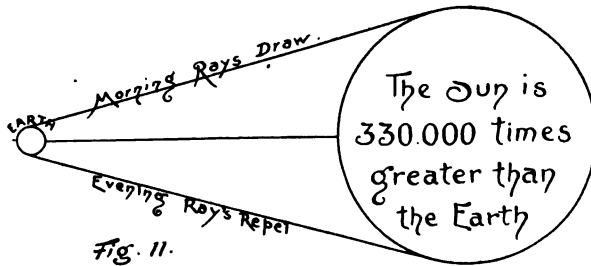
of it, and no proof of it ; but I assume, on the contrary, that what is called "ether," is reasonably a sea of electricity ; that it is everywhere, at all times ready and available, to be used over and over, and *never exhausted*.

I assume that every revolving body in the heavens, is a dynamo. The question is, whether every revolving body, everywhere, is not a dynamo, to a certain extent. Take the earth, for instance ; it revolves ; it collects electricity at the equator : it discharges it at the poles ; hence the polarity of the earth, and the polar lights. There is no other mode of accounting for the northern lights. There is no mode of accounting for ordinary light, except by attraction and repulsion of particles and the leap of sensible electricity between particles. I assert that polar light has been, and is, in the dark, and is occult with writers to this day. They go all around it ; they speak of everything but the simple word, electricity. They give you facts, figures, distances and everything that ought to suggest the idea, and yet it does not seem to present itself to their minds.

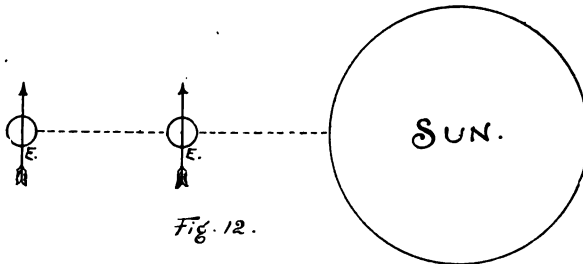
It is a known fact, that when a current of magnetism, or a current of electricity, strikes a globular body, it spreads to the ends. Take, say, an iron body shaped like an orange. The instant effect is it spreads to the ends or poles. That is known. That is the result of experiment in the laboratory. Electricians make that assertion, *it goes to the poles of a cylinder*, but they make no reference beyond

that. This is simply as an experiment, in magnetism, in the laboratory.

Now, I will draw a circular line about two feet diameter; that represents the sun; and the sun is 330,000 times larger than the earth; and now two hundred feet away, I will put down a June pea; that represents the difference in distance and size between the sun and the earth.



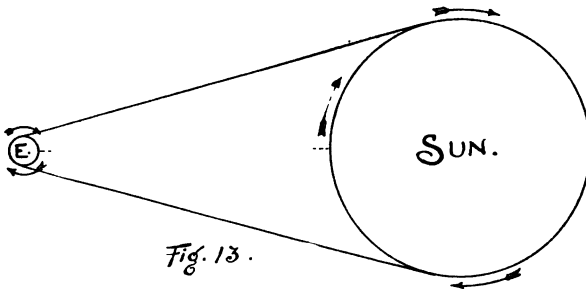
What I wish to do, is to produce the centrifugal force of these planets, which means nothing but a tendency to fly in a tangent from the track. There never would be any such centrifugal motion, as that with a planet, if it were not for its turning on



its axis. If it did not turn on its axis, it would be held like in diagram, Fig. 12.

The earth would go in a right line to a certain distance from the sun, until it got to the point of negative electricity; and then it would come to a stand; then it would draw back to a certain distance from the sun where it would become of the same electricity, and repeat. It would be a straight line to and from the sun, but by turning on its axis it gets the centrifugal tendencies, or force. It is represented familiarly when you turn a grindstone rapidly. The water is thrown off in a right line. But attraction to the centre of the sun, holds the planet as if it had an India rubber string attached to it; it can move, but it is all the while held towards the centre of the sun, by the same law of electro-magnetism.

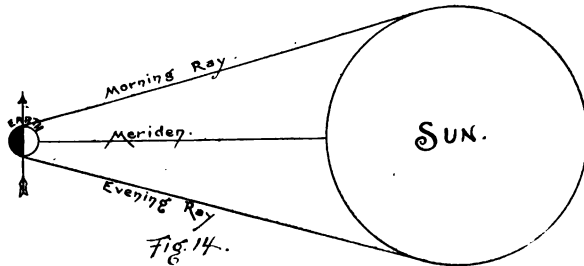
All of these bodies, revolve from west to east. If the sun revolves from west to east, and electri-



city travels in a circuit, as it always does, as that turns, the earth turns in the same way. This is the

old spinning-wheel, reproduced. You will perceive, by that familiar comparison, that the sun and the planet present to each other opposite faces, as any two points pass, while in motion ; sustaining the theory of attraction and repulsion, claimed as electrical.

The sun revolves in that direction, from left to right, and as it turns on its axis once in twenty seven days, you can easily see how it would make that little body, the earth, spin.



Let an orange represent the earth ; a lamp represent the sun ; one half of the earth is shaded, therefore negative. The sun, in the morning, being positive, pulls on the negative side of the earth at its rim, or periphery, a little past the centre. Now, if you let that ray, running from the upper rim of the sun to the upper rim of the earth, represent the whole of the upper rays, for they are everywhere down to meridian, it pulls, gradually wasting in attracting force, until it comes to meridian ; then, the side of the earth, toward the sun, is

of the same electricity with the sun, because the rays of the sun are perpendicular and dead, or directly upon it. When it becomes of the same electricity with the sun, then begins the process of gradually repelling, until at full force, at the circumference of the earth. In the morning it draws, that is, attracts; in the evening, after meridian, it pushes, or repels. The simplest and, to my mind, the most plausible theory of the revolution of a planet that can possibly be given; the two opposite forces being equal, balance each other and keep the planet in place.

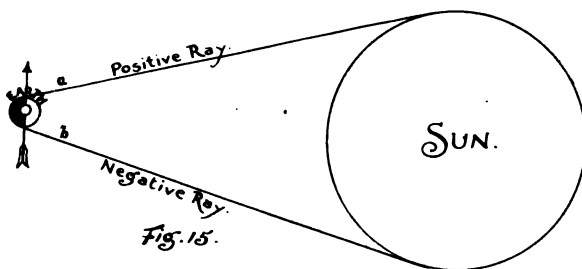
Nearly all astronomers in treating this subject, wind up in the last chapter with: "That these things are among the mysteries of Providence, which have never been explained, and probably never will be."

I agree with some of my friends, that it is no argument that because a thing has never been done, it never will be done.

I know of no other possible way to understand it; there is no other way; and that, to me, is a clear explanation of planetary motion.

We have seen that the planets keep at respectable distances apart. We have seen that they revolve on their own axis, and about the sun; and the sun revolves on its own axis, and that the sun is an immense dymano, collecting electricity, and has its polarity with the rest of the solar or planetary system, and that they all respect each other, as they must, according to the demands of the laws of electricity.

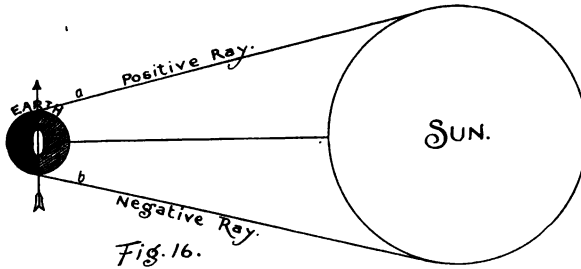
I wish to speak here with regard to another idea, (see Fig. 15).



In the centre of the earth is heat. It is a matter of great speculation. Some claim that the whole centre of the earth is lava. As you go down a shaft into the earth the heat increases in proportion to the depth. That is the argument. It is claimed that the outside is the cooling off of a molten condition. Very reasonable. But I will show you in a minute what constitutes heat.

The dark half of the earth, in Fig. 15, is negative; the lines *a* and *b* represent the rays of the sun on the two sides.

It is a law of electricity that a current of electricity returns to its source by the shortest possible route, as has been proven by recent experiments. I think an electrician tried the sending of a current of electricity around a given circuit, and let it have an opportunity of touching the earth before it made a perfect circuit. He found that when it touched the earth it went directly back to its source in the shortest possible course it could take.

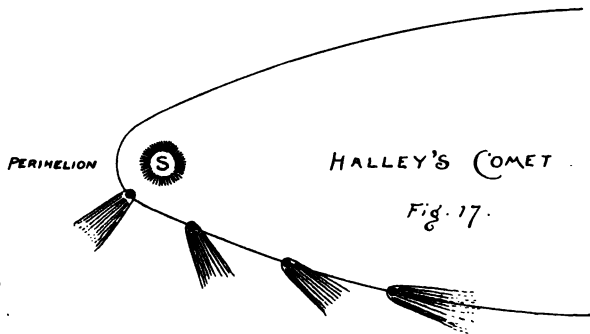


It is known that where two currents of magnetism (electricity is the same) come together there is always a spark,—*b* is a ray negative, *a* is a ray positive (Fig. 16). They meet in the centre of the earth. The instant they strike earth, on either side, they take the shortest distance right through the earth, and come together in the centre of the earth. Where they come together there is a spark. Considering the immense difference between the sun and the earth, and that the sun is 330,000 times larger than the earth, those rays, where they come together in the centre of the earth, raise the query in my mind as to whether they would not, in the aggregate, account for all the heat in the centre of the earth that is claimed for it. When we come to measure it, the quantity and the force, you can easily understand, simply by what is going on under daily observation, how probable may be the hypothesis.

It is purposed, for instance, to gather electricity at Niagara Falls with water power, and send it to Cleveland, Ohio, two hundred miles away, and there utilize 25,000 horse power in making and working iron.

To give you some idea of the force of electricity, it is used, as you are aware, in running street cars, and, in my opinion, it will be used in running trains across the continent ; to say nothing about the endless amount of small machinery propelled by it. It has more force than people are disposed to credit it with. You should keep in mind the law of mechanics, which increases in power as motion diminishes. You should also bear in mind that the motion of electricity annihilates time ; its rapidity cannot be estimated aside from friction ; therefore the opportunity of slowing down of the motion is very great. And again, when planets are in vacuo, the resistance is nothing.

We talk about the "Molten Age," or the period of the earth when it was hot or melted. Fig. 17



represents the "Halley Comet" going from the sun. Herschel said he was watching that comet, studying it carefully, and that he watched it until



it passed perihelion. He said that as it went past the centre of the sun it became melted, and then a mist; and when it passed on it solidified and took its original shape.

If planets have been comets, and comets may become planets, it is easy to see that the earth may once have been a comet; and when it passed this point, at perihelion, its condition was molten; and when the circle lost its acute angle, and the ellipse line, being further from the sun than when it formerly passed at perihelion, it lost that molten condition, and ceased to go near enough to the sun thereafter to be melted again, remaining permanently as it is now, with the igneous rocks nearest the centre of the earth; or as they would be when they were melted while a comet.

If our theory is admissible, it will give light to many geological speculations. Of these speculations you have as good a right to judge as anyone.

If I have set forth clearly the dual qualities of electricity, I will go a little further. I call this celestial life, cosmic life. It is life, not death. If you keep constantly in mind the dual quality of electricity, that it draws to and repels from with equal force, and answers to all of the laws laid down by Newton, as to inverse squares of distances, etc., you must see, if it is so, that they are identical. To say the sun is a mass of electricity will not do exactly; for the spectrum shows analogy between it and the earth. There is some speculation as to how the light of the sun, of the electricity of the sun, is collected. The sun's revolution



as a dymano, to my mind, is sufficient. Electricity is collectible, not generated ; and the sun collects from the sea of electricity, just as do the other bodies.

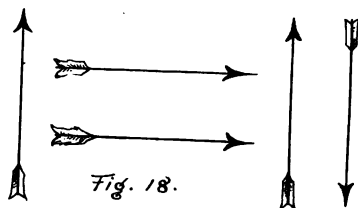
You are aware that the best evidences are that the sun is dark, opaque and solid in the centre, with a white luminous atmosphere of great depth, which seems to have a different or reverse motion to the body of the sun. That covering is called the sun's corona. That apparent difference in motion may be caused by the difference in density. The brilliancy of the corona invites the suggestion that it is electricity made sensible by the revolution of the sun, on electro-dynamic principles. Keep in mind the difference in magnitude between the sun and anyone of the planets, and the fact that it is 750 times greater than the whole of them put together, and you can easily see how it could put in motion the sea of electricity in just such currents as would cause the planets to revolve. Then again we have no other alternative but to say these forces between the sun and the planets are reciprocal ; not only between themselves, but between our solar system and others.

Dr. Ludwig Struve's determination of the motion of the solar system in space, as published in the memoirs of the St. Petersburg Academy, is derived from comparisons of the positions for 2,500 stars, recorded in catalogues of 1755, and again in 1855. These show that the solar system is moving toward a point in the constellation Hercules. The motion for 100 years, as it would have been seen



from an average sixth-magnitude star, was 4.36 seconds of arc,—a rate corresponding to an actual velocity of about 13 miles to a second. Combining his results with those obtained by other astronomers, Dr. Struve finds the point toward which the sun and its family of planets are speeding to be still in the constellation Hercules, and the mean velocity to be 15 miles a second.

Again: here is an idea that I had nearly forgotten. Fig. 18 is a magnet: I have shown that when

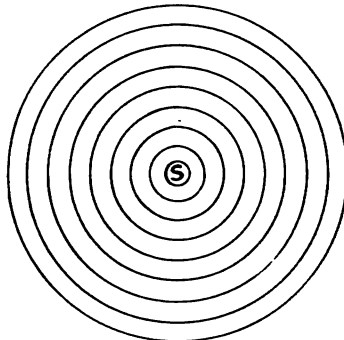


the poles of any two are the same way they will not come together, but when I reverse one of them they will come together. It seems to be a law that when two of these infinitesimal particles have come together, although they may be dust, and so small that no glass can reach them freely, they unite, and the two become one magnet, with a north and south pole. It is known also that if you put a third one on top of these, it does not change the polarity of the first two. That is a very important idea, simple as it is. If it does not change the first two, and it does not, you can keep laying them on until you make the mass as large as you please.

But a few days since I went into a station where there was a dynamo running, and a number of bolts

were handed to me. I put some of them on the dynamo ; they stood fast. I added others ; they stood fast. I placed more of them around and made a base ; they all stood fast. I then built on and raised them until I had a small pyramid, 10 inches high. This will illustrate the possible theory of building up a planet with electro-magnetic dualities from small beginnings.

The following diagram will show a planet in position according to the Laplace theory, which is the best that has ever been given, and has stood the test of criticism the longest :



*Fig. 19.*

The Laplace theory, you will remember, is simply that of the undeveloped sun in the centre, and the whole universe, like a blackboard, dark and resembling smoke. He sets that universal smoke whirling, but does not say by what means, and he says that the outside has so much more distance to go over than the inner circles, that it grinds out, or

off, a circle or ring on the outside, independent of all the mass;—that circle, when detached from the mass, begins its uneven motion and bursts open, and assumes the globular form,—that makes a planet; then comes another, and that has broken its circles, as the first did, and stands off by itself; and so the process goes on, until you come close to the sun. He started that great mass without cause, thus proving the whole universe without position; and still, if he grinds out such rings, and they burst open, the mass moves against something resisting, which makes the one go faster than the other, and disturbs the equilibrium; if in a vacuum, the whole mass would move alike; but if you have an atmosphere like the sea of electricity, and you gather that, and with its attractive and repulsive qualities, can build up a planet out of a little infinitesimal dust, every particle of which is a magnet, you have got one which takes its place with regard to the sun, according to its laws, mass and densities, exactly where it belongs. Having the planet in process of being built up, it begins to revolve in obedience to that law, that each little particle being a magnet shall be attracted and repelled. It begins to revolve at once on its axis when but one particle, and once in motion, in vacuo, never ceases. The earth, if in vacuo, would be made to turn, and continue to turn, by the same force that made it turn when it was a microscopic particle; it would never cease, and the more you add to its volume, the more persistently the same law holds good. A fifty-ton balance wheel once in motion requires but little

force to keep it in motion, and comparatively none, if in a vacuum. The law of electricity, we have tried to show, is ample to supply this force. If this theory is plausible for a planet, it is equally so for the presence of the sun itself.

In the mineral kingdom the same laws apply as to crystallization. Take lime, for instance, which enters largely into the foundation of the earth. Take, also, all of the salts of metals. Take the diamond and all other forms of carbon. Take silix in all of its forms, and in fact everything that crystallizes. You will find that they will reproduce their copy in every instance. By the dual modes of electricity, the particles are picked up and laid down, in accordance with an unknown law as to form, which makes the crystal every time a copy; but they are undoubtedly brought by the laws of electro-magnetism, to other particles, until the copy is formed.

The known matter of the earth, including ocean and air, and assuming the known crust to have a thickness of ten miles below sea level, is calculated by Professor F. W. Clarke to have the following percentage composition :

Oxygen . . . . .	49.98
Silicon . . . . .	25.30
Aluminum . . . . .	7.26
Iron . . . . .	5.08
Calcium (base of lime) . . . . .	351.00
Magnesium . . . . .	2.50
Sodium . . . . .	2.28
Potassium . . . . .	2.23
Hydrogen . . . . .	.94

---

Titanium . . . . .	.30
Carbon . . . . .	.21
Chlorine and Bromine . . . . .	.15
Phosphorus . . . . .	.09
Manganese . . . . .	.07
Sulphur . . . . .	.04
Barium . . . . .	.30
Nitrogen . . . . .	.02
Chromium . . . . .	.01

---

At the lowest estimate, nine elements constitute 98 per cent. of all terrestrial substance. Taking the density of the earth's crust as 2.5, it is found that the percentage of the atmosphere is .03; of ocean 7.08; and of solid crust 92.89.

Now, I wish to apply this to what we call Life ordinarily. Dr. Mitchell, in his admirable work on the "Evolution of Life," has done a good service, and will do a greater one. When I read his book I was charmed with it, but I said to myself: "The Doctor wants to connect one link more back in the chain of evidence; let him tell us what Life is,—the specific principle, the *vis vitæ* of everything, and then let him take up the matter and give us the evolution of animal fibre." He begins in his illustrations with what he calls protoplasm. If I understand, and I am not particularly well versed in it, protoplasm appears in the shape of little so-called cells, not differently shaped from a lemon, but you must have a microscope to see it. Now, there are two cells; they are necessarily in shallow water; they must have the electric rays of the sun to vivify them, or to give them the evidence of active life. They cannot exist in deep water. The sun strikes

them, and that globe of protoplasm, becoming of the same electricity throughout, divides itself into two parts in obedience to the law of repulsion,—similarly electrified points repel, or divide the cell of protoplasm. The separated portion moves away from this half cell, and moves where there is another cell that has divided, and attaches itself to an opposite half of that cell; and there is a wedding, a veritable marriage, under the law of attraction and repulsion. This is going back as far as science can yet go, and that too by the aid of the microscope to discover the first original *marriage*. When those two bodies come together, this negative and that positive, there is a spark of electricity, caused by the friction of the concussion between particles. That is Life. There begins the foundation idea of what we call Life itself on the earth, after cosmic life.

I quote from lecture published: “But among the whole sisterhood of science, the greatest proportion of inference is the science of biology itself. Strip biology of everything except the concrete knowable, and do away with all conclusions by inference, and it would be hard to imagine what a congress of biologists would find to talk about. If they began with mentioning living protoplasm—what is life—how much do they know? That’s the word now, *know* that said protoplasm is living or not living, or how much living, or when it began to live, and what it does when it stops living? For is not biology the science of life?”

As the leading author in the English language



on Physiology, Prof. Michael Foster, says (p. 36, fifth ed.): "Our knowledge of the nature of protoplasm cannot at present, and possibly never can, be recognized by the microscope, and therefore must be based on inferences;" and again (p. 34): "The differences between a dead human body and a living one are still, to a large extent, estimated by drawing inferences rather than actually observed."

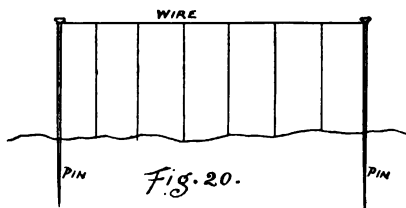
The Doctor goes on. He treats of Vegetable Life, but he simply speaks of its succession on the earth. When you come to study carefully Vegetable Physiology, you will find that the vegetable growths are caused by the attractive and repulsive powers of electricity.

"The influence of the electric arc on vegetation is said to have been strikingly shown in Berlin in the spring of 1891. On some large lime trees the branches under the electric light displayed new leaves of considerable size, while the buds on opposite branches, where the light does not strike, were only just beginning to develop.

Lebieg says "that to build up an animal or a plant, we must have the material; if you build up a house you must have the brick, lumber, mortar, sand, etc." There is nothing created; it is simply picked up in one place and laid down in another. The attractive force of electricity picks up this material, carries it to its locality, and keeps piling on, until it builds up a plant. When that polarity is reversed, we say the tree is dead and decaying. When it falls, the same laws are at work,—similarly electrified bodies repel,—and those particles are all

sent into the air by the attractive and repulsive power of electricity.

Everyone knows the effect on a vegetable when grown in the dark,—the vines stretching away towards the light are pale and tender. A friend of mine told me that he had a bed of vegetables; he put a couple of surveyors' iron pins in the ground, one on each side at the end of a row, and a wire across, to connect them. He was a very sensible man, and assured me that that row of vegetables outgrew the others. If so, it proved that electricity had something to do with the growth of those vegetables. It picked up the materials and laid them down in the form of vegetables, more vigorously than the others.



Take sugar, a vegetable product. Sugar crystallizes in particular forms. You will see in rock candy an illustration better than any perhaps. They put a saturated solution in a glass vessel, and they expect to crystallize it, and make rock candy. Oftentimes (and oftener than otherwise) that fluid is in a measure insulated; the process of crystallization not being active; and in making sugar it is a cardinal idea to have the light properly arranged to shine upon the fluid to make the crys-

tallization active. At this stage, the man who is performing that service throws something into it which shapes the fluids, and the process of crystallization will commence. Generally in the specimens of crystallized sugar which you have seen in the shops, there is a string in the bunch of candy. That string is dropped over into the jar ; it conveys a current of electricity ; then the sugar in the syrup begins to crystallize. Attraction and repulsion are evidently necessary to mineral and vegetable organization and dissolution. A similar effect is produced on iodine and camphor by sunlight, which we claim is electrical.

Next, we come to what is known as Animal Life. Animal Life is the result of the same process,—attraction and repulsion. Here are two cylinders, one of wax and the other of glass. If I take this cylinder of wax and touch it to a pleget of cotton, it will not attract the cotton ; but if I rub it briskly on my sleeve, it will then attract the cotton, and hold it. That is arbitrarily called resinous electricity. If I take this glass cylinder and apply it to the cotton, it will not attract the cotton ; but if I treat it as I did the wax cylinder, with brisk friction upon my sleeve, it will attract the cotton and hold it for a time. That is arbitrarily called vitreous electricity. If after a brisk friction I bring one end of each cylinder together, there will pass between the two ends a spark of electricity.

Everything in Animal Life comes from an egg. At a certain moment, of the most ecstatic orgasm, during sexual commerce, there is a spark of elec-

tricity passing between the positive and the negative, which vivifies the egg; that spark of electricity in the egg becomes a magnet; by being a magnet it is localized, and it there remains dormant until the rays of the sun, or some other electric force, such as heat, reaches it, when the process of incubation begins; and the electro-magnetic building up goes forward under an unknown law as to form, until perfection is reached, in whatever species or genus may be in hand.

Of course, when the being comes to the air, what is known as atmospheric life commences. I assume, that a general muscular action, in which the intercostal muscles take a conspicuous part, by and through electrical stimulus upon the nerves of the skin, producing a tendency to a vacuum in the lungs, into which air rushes, induces the first inspiration, or endosmose, of so-called life. But we should not lose sight of the fact that a plausible auxiliary may be found in the probable, consecutive re-action of the ribs from previous compression of the thorax.

“No fragment of knowledge is too small to be of possible service to science, and there are many fields yet open for investigation in which the patient—even if unlearned—explorer may find facts that will eventually prove useful. A few of the places where work remains to be done have been suggested by Professor Oliver Lodge. The influence of magnetism on living organisms, for instance, has been little investigated, and it is yet an undecided question whether some delicately organized persons are not able to perceive the invisible force that so

powerfully acts upon iron and steel, while nothing is known of how phosphorescent or electrical animals or electrical plants might behave in the magnetic field. A determination of the facts might bring unexpected and important developments. Experiments on growing seeds under different influences,—electrical, magnetic, optical, thermal, mechanical and chemical,—are not unlikely to lead to an astounding discovery some day. The study of the action of light on different substances has only just begun, although the effect of luminous rays in reducing the electrical resistance of selenium one-third or one-half is full of amazing possibilities. Much is yet to be done before photography is fully understood, and there are invisible rays in the spectrum and possibly in celestial bodies, yet to be caught by the camera. To owners of induction coils a whole continent of unexplored territory has been opened up by the discovery of Hertz that electro-magnetic waves in air can be easily produced and detected. These electrical waves have been obtained as long as 2,000 miles, and as short as one foot, while if shortened to the 10,000th of an inch they would affect the retina and be visible.”

Light, heat and electricity are so near alike in all of their qualities, all material, and all travelling from the sun to the earth in the same time, (eight minutes and seven seconds), that it is very questionable whether they are not the same thing; or light and heat the result of electrical action on matter. Sun light and electric light take photographs most satisfactorily; no other light will take a

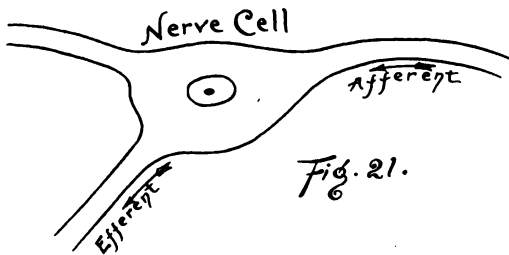
photograph so well ; showing that electric light and sun-light are the same. Again, iodine, which is a vitalized mineral in photography, if put in a jar in a dark place, remains quiet ; but if you set it where the light strikes it, it will crystallize on that side toward the light, showing that the light has not only something to do with it, but that light is material.

Electricity is latent and sensible. And so of heat. Latent electricity passes over wires and you see nothing of it ; but when it comes to where there is a break in the current, then it is sensible ; you see it. So of heat, where there is condensation. Now, electricity is passing from the sun to the earth, and so is heat. As soon as it reaches particles of matter, then begins that sensible leap of electricity from one particle to another, giving out the spark ; and so does heat ; and when it reaches the earth, in that undulating manner, generally comes to us as what we call light. So of heat, when air is compressed. The question is,—whether those rays strike any particle of matter which may have had in its origin electricity in itself localized in the shape of magnetism ; but, when you come into the chain of cause and effect, you must go back to electricity. These are occult matters. We cannot see, but we can possibly get a great many concrete ideas which bring us knowledge ; and it is the duty of every man who has progressive opinions to have the courage to assert them.

If electricity then performs everything that is action ; if its force is everywhere, in all material

existences,—it is omnipotent. I cannot see how, in the sense of knowledge and mind, (the true sense), it can be otherwise than omniscient. If electricity is ubiquitous, if it is everywhere where matter exists, if it accounts for everything growing up, and tearing down, and every definition of matter, it is omnipresent, (exists wherever matter exists), omniscient, (knowing everything), and if it is the active force in all work, it certainly is omnipotent.

Now, as to mind. We have a mind. The question arises : What is mind ? Say mind is the brain, manifesting itself through the nerves. There are two sets of nerves ; one set, afferent, brings impres-



sions to the brain ; the other, efferent, carries them out. Take a telegraph line. When a message is being sent, the receiver stands perhaps at the door, looking out upon the ground, with the wild stare of a somnambulist ; he comprehends the meaning of every click of the lever, and when the message is ended, he turns around and repeats the whole of it. It was recalled to his brain as clearly as if it were composed of words. Words are said to be signs of our ideas. Those raps were the signs of those let-

ters, and when put together in his head, made the message, or signs of ideas.

We assume that all mind is simply made up of the aggregate of electrical impulses on the brain. The nerves are more fully distributed on the outer surface or skin, the Doctor will tell you ; and if the electrical impulses do create a language, as they evidently do in telegraphy, then we want to see how it works in the animal economy. Now, here is an impression : An afferent nerve that comes out to the surface finds a pin stuck in my hand ; it carries at once the message to my brain. A remedy is suggested, and it comes out through the efferent nerve, and immediately I extract the pin, and brush it away. I need not cite the extravagant muscular effect produced by sending a current of electricity through the nerves of a frog, or more markedly upon a subject placed upon the dissecting table, to prove that the active agent in carrying impulses over the nerves is electricity. No other force annihilates time. That is what I call life. That corresponds again with the utility of electricity in everything else that is material. You will see, then, if I have given the animal life through electricity, that I have reached pretty near the point of what is life. Take for instance the five senses. If a man stands here and has never known the value of the five senses, he is as much a statue as if he were carved, only that he breathes. Locke's argument is, that if you give that statue eyes, he sees ; if you give him ears, he hears ; if you give him the sense of smelling, and of tasting, and of touching,—



in fact, all of the senses,—when he has the whole five, and breathes, then he is a living animal, and he is not entirely so, although he has the vital principle in him, until he has those five senses.

Many of you will remember the anecdote of the child, who, having been born blind, was couched, and a cataract (an opaque lense) removed from each eye; when brought to the light, the first object presented to his vision was a cat, which he had known familiarly by the sense of touch. He promptly inquired: “What is that?” When he put his hand on the animal, he exclaimed: “Oh! so, Pussy; I will know you the next time.” In this instance you will see the independence of each of the senses.

You take again the eye, as a camera; it makes its afferent impressions upon the brain. It is a singular law of the nervous system, that when one impression is made upon it, it is never disturbed by any other impression; therefore, you can keep on gathering as many as you please. All these five senses are making impressions on the brain, and they are recorded, exactly as telegraphic messages are recorded on paper; it is just tap, tap, tap, without sign.

Take, for instance, Casper Hausen: You will remember that he was a German, found standing like a statue on the corner of a street, and looking at space. He was a mature man, with all his senses, but in his infancy had been put in a cell; a dark cell; until he came to his majority; then he was turned out. The speculations were that he was

probably some prince, but I never entertained that theory. I believe that the German materialists and philosophers wished to show that man is nothing, outside of experience, and that there was no education, outside of experience. They took him and educated him, brought him up consistently, taught him the use of the five senses, until he could utter the language of his history. Then he told how in infancy he was put into a dark cell; somebody came and fed him, but never spoke to him; finally he was taken out and left where he was found.

You will see that man is nothing outside of experience. Experience is his education. I give you a book on the sword exercise; you learn it; repeat it from beginning to end. Are you a soldier? Not at all. I put a book on the musket drill in your hand; you memorize the book on the musket drill, and repeat the whole to me; but what do you know about the musket? A man who has had experience with it would thrust you a thousand times before you could make a parry. You take a book on mathematics, and you repeat the whole arithmetic to me. Are you a mathematician? No. You have to do the work, according to prescribed rules, and experience is your source of education. These experiences, in the aggregate, constitute mind in the concrete.

I hope I have given you the right idea. I believe that if you hold to the law of electricity,—its attractive and repulsive powers, which balance, you will solve any question in physics, if you are patient.

“Therefore we have come now upon another grand element in nervous operations, whose importance cannot be over-estimated, and that is habit. The whole nervous system, indeed, is organized by habit. However complex, for example, be the movements executed by muscles in order to produce a given effect, such as movement of the eye-balls, some muscles contracting strongly, others most gently, others relaxing just enough to allow their opponents to contract just so much and no more,—all these perfectly associated movements are nevertheless explicable only as the slowly acquired habits of the centers which supply those muscles with their motor nerves. But here comes the important question: How did these centers come to acquire these habits? The answer is, from a thousand thousand times repeated afferent impressions, such as those of the afferent optic, or sense of sight, nerve, in habituating the efferent or motor nerves of the eye muscles to act together. Physiologists, therefore, when they speak of nerve centers being organized to perform such and such functions, mean not that the nerve centers have been created so from the beginning, but that habit has so organized.”

*Per contra* here is an idea that I may as well speak of: There is, in one of Saturn's moons, a contradiction. They are all going one way, but one, and that is going the opposite way. I simply say this: I have no sufficient light on the subject that will explain it to you, but I believe with the most intense faith that if you stick to that principle of electrical attraction and repulsion, you will find

that it will be solved. It may be this: Here is one moon, and there may be another, and there another. This one may move in a different time from that, and may not go as fast as that one on the inner circle, yet be going and turning the same way, only not in nor at the same time and speed. In this, or similar ways, mistakes have been made.

Ladies and Gentlemen: I do not know how I can get down nearer to the *vis vitæ*, or principle of life. There is no death. Under that principle of science, there is no such thing as death. The particles are brought together necessary to constitute the planet, vegetable or animal, and they are laid down, and that builds up. Take, for instance, nickel plating; put a copper wire into a solution of nickel and send a current of electricity through it, the nickel goes on to the copper or iron; it is attracted by the copper or iron and held fast there. You lay that on just as thick as you please. That is what I call life. You reverse the poles, as I am told, and you can take the nickel off, leaving the wire just as clean as it was in the beginning. That is what I call death. The same laws are at work, in what we call life, in building up, and in what we call death, in tearing down, or separating. *Be it understood*, that the whole universe is a theatre of these two actions,—one of building up, and the other of tearing down, which nothing known can accomplish except electricity, through its dual forces of attraction and repulsion.

---

LIFE IN LAW, OR LAW IN LIFE.

Blackstone, in his Commentaries, and Montesquieu, in his Spirit of Law, I think both of them, define law to be "*a rule of action.*"

There is beyond all of this discussion the very subtle question as to the law governing all of this universal action. It has been treated as a governing force, itself independent of matter. If so, then, an immaterial, ideal power is controlling matter. Can such a power be in force? If, as I claim, electricity is the force active in all that we call life, cosmic, mineral, chemical, vegetable and animal, can the law exist independent of electricity? We may say that electricity has specific modes, but are they independent of that material substance? or of any, or of all matter? To illustrate: If we had the power to take, and did take, a planet from this solar system, would the much claimed ideal and immaterial law, which makes it revolve on its axis and go around the sun, be lost? Or would the planet, if placed back in its orbit again, begin at once to revolve upon its axis, and, as before, go round the sun? If the electrical forces and their dual modes are well explained and applied, I can see no reason why it would not; therefore, must conclude that it would; but independent of some material force in, or constituting the law, I cannot see how it would. I cannot see how law can manifest itself independent of matter; and therefore, cannot see how it can have a being independent of matter. Logically, then, there is no such law or power, (as nothing, controlling something).

**LIFE IN TIME, OR TIME IN LIFE.**

The great stumbling block to faith in evolution is time. The time that it takes to bring about the astronomical, geological and generic periods, in which changes are accomplished or going on. We can get, in our minds, somewhere near the time of some changes that have taken place in the immediate past, and what may possibly take place in the near future ; but when we try to go back in the far distant past, we are lost in the feebleness or poverty of our imagination. The human mind is disposed to deal with the present, and estimate everything by the experience of a life ; therefore, to arrive at anything like an approximate understanding of time, the mind must be fortified by a comprehensive brain, great and patient study, numberless facts clearly classed and arranged, and then, under the most favorable and flattering circumstances, falls infinitely short of an approximate comprehension of the time that has past in working the changes of evolution.

To illustrate: Suppose this planet, earth, was made up of a thread, as fine as the thread of a silkworm's cocoon ; and the loose end of the thread was made fast, and the ball unrolled at the rate of one thousand miles for each and every hour until the inner end was reached ; let that thread be stretched in a straight line, to represent time. Where in that distance would a man locate his existence, or how much of that line would represent its duration ? The point of a cambric needle would cover millions of generations.

Again, let every planet in the whole solar system be treated in the same way, and in succession tied together and unrolled to the outer extremity of the last, and then repeat the question: Where in that distance will any man locate his existence, and how much of that line would represent its duration? When you have pondered over this comparison, you may include the sun itself, which is seven hundred and fifty times greater than the whole of the planets combined, and you would not reach much, if any, beyond the last. Have courage, and include every star in the stellar universe, before you would more than reach the end of the line, representing the *beginning* of time necessary for the accomplished purposes of evolution.

LIFE IN EMIGRATION, OR EMIGRATION IN LIFE.

Dr. Mitchell tells us that life began in the quiet seas at the base of the Laurentian Hills, and that these hills which were the first dry land uplifted above the Siberian seas, began at Labrador on the east and stretched away in a northwesterly direction to the Straits of Behring. He says that the apes originated in our western country along what is now the eastern slope of our Rocky Mountains, in the early miocene period. They afterwards migrated to Asia and Africa, where they found favoring conditions of life, and in a later geological epoch underwent anatomical changes and gave rise to the great Anthropoid, or man-like apes. Under the influences of migration, climate and changed modes of life they slowly became transmuted to the

lowest forms of men. After a long lapse of time these lowly forms of men became more highly developed and in the course of ages overspread the earth, always maintaining *a general westerly direction in their migrations.*

That agrees with all of the facts of paleontology, and existing natural history. But since history began to be written, for the recording of human events, so persistent has been the spirit of emigration in a westerly direction that it has given strength to the belief that it is an established and admitted law that has not been questioned until the Chinese attempted its reversal. That exception is now meeting with such a construction as to warrant the belief that it will not, to a general extent, more than a trip to Europe, interfere with the great westward flow, that authorized and has sustained to this day the comprehensive expression that "westward the star of empire takes its way."

The law of emigration has never failed to prove itself the law of selection, picking its subjects from every race and nation; never, as a rule, choosing weak people, but bold, vigorous, adventurous subjects of progressive thoughts and minds, abandoning the obsolete and embracing the new. In other words, it covets the reformer; men of advanced and progressive views, who have made themselves offensive to the existing powers that were, and by their intelligent, clamorous complaints of legal and social abuse, have made themselves the subjects of proscription, ostracism and death; having had to choose between losing their heads or fleeing for



safety. Others, for various hopes of personal benefit, including wealth and personal aggrandizement, or for whatever reason, have never lacked *courage* and *execution*; hence, the maxim for many centuries has been, "To the East for education, to the West for reliable soldiers."

This law of emigration, being synonymous with *selection*, progression, energy, enterprise, courage, and I think I may include generally, the crossing of races, and the survival of the fittest, carries with it the qualities necessary to evolution, in all that the term implies. Therefore, from Tartary to America, as history shows, the emigrant's line of march has been characterized by the birth, growth, maturity, old age and death of towns, cities, nations and empires; each succeeding nation greater than the preceding, in wisdom, skill and strength, until to the law of emigration we look for the secret of America's ascendancy in the line of popular strength and transcendent greatness.

Will the rush of emigration go forward to Japan and to China, and thence, once more and again, by increased and increasing facilities, repeat the circuit of the earth, each time, with the evolutionary demands of the law of emigration, until the human being of thousands of years hence shall enjoy conditions inconceivably in advance of the present? If emigration is one of the inevitable laws of population, irreversible and eternal in its course, what may we not hope for in the far distant future through the laws of evolution? As the earth rolls from the west toward the east, steady and ceaseless